

# IT ALL STARTS WITH **SOIL**





# SOIL STATISTICS

WHEN WE LOOK AT SOIL, WE FIND  
SOME **AMAZING** NUMBERS!  
READ THIS PARAGRAPH ABOUT SOIL.  
THEN SOLVE THE PROBLEMS BELOW.



We depend on **soil** for so many things. Soil helps clean **water** by filtering it. Soil helps make our **climate** moderate by absorbing and releasing heat. Soil even provides a place to build **homes**. Most importantly, soil helps us grow **plants**, for food, animal food and building materials.

We sometimes take soil for granted. But good soil is a **treasure**. The United States has about 2,250,000,000 acres of land. About 41% of that land is used for farmland. About 46% of farmland is used for growing crops. But only about 45,000,000 acres are ideally suited for growing crops. The rest require careful management and irrigation.

New soil forms slowly. Soil formation varies, but some scientists found that it takes 1000 years to form 1/2 inch of soil. So we need to take care of soil we have.

Soil can be lost through **erosion** from wind and rain. Keeping soil covered with plants helps conserve soil. During one heavy rain, an acre of bare soil lost one thousand times as much soil as an acre covered with plants.

Keeping plant cover on soil also increases the organic matter in soil. This organic matter includes plant life and millions of visible and invisible organisms. Some scientists estimate that an acre of soil holds about 1,000 pounds of microscopic life. The life in soil helps keep it rich so it can keep helping our lives.

## Questions:

1. How many acres of land in the United States are used for growing crops?

\_\_\_\_\_ acres

2. What percentage of land in the United States is ideally suited for growing crops?

\_\_\_\_\_ %

3. A farmer left a field bare and lost a lot of soil during a flood.

The next year, he kept the field covered with plants, and only lost 65 pounds of soil. How much soil did he save that year by reducing erosion?

\_\_\_\_\_ pounds

4. The Hartland family estimate they have 225 tons of microscopic life in the soil on their farm. How big is the Hartland farm?

\_\_\_\_\_ acres

### Goal

Students read a paragraph describing soil availability, soil formation, erosion and conservation, then complete math problems based on the information.

Answers  
1. 424,350,000 acres  
2. 2%  
3. 64,935 pounds  
4. 450 acres



# Systems of Soil

SOIL IS **FORMED** AND **CHANGED** BY A SERIES OF COMPLEX EVENTS. LIVING AND NON-LIVING THINGS WORK TOGETHER ALL THE TIME TO CREATE AND ALTER SOIL. READ THESE SENTENCES AND WRITE **YOUR OWN** SENTENCES TO DESCRIBE THE SYSTEMS OF SOIL.



Soil is a result of ongoing **natural processes**.

Name two natural processes and describe how they help form or change soil.

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Soil provides a **habitat** for living things.

Describe a plant or animal that lives in soil and how soil provides what it needs to live.

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Soil looks solid, but can have many tiny **spaces**.

Describe at least two important reasons that living things in soil need spaces there.

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The life and death of animals in soil help change the nature of soil.

Describe two ways a living animal changes soil.

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Describe two ways that a dead animal changes soil.

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**Organic matter** includes living things and their remains. People can improve soil by adding more organic matter to soil. List three ways people can add organic matter to soil.

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## Goal

Readers analyze factors that form or change soil and write original sentences to describe them.



# Describe the Dirt

EVERY SOIL IS A RESULT OF A UNIQUE COMBINATION OF MATERIALS AND FORCES. SO EVERY AREA OF SOIL IS **DIFFERENT**. SCIENTISTS USE OVER 15,000 NAMES TO DESCRIBE SOILS IN THE UNITED STATES ALONE! HERE ARE SOME OF THE CHARACTERISTICS THAT DIFFER BETWEEN SOILS.



- **Color**
- **Texture** - How much of different size particles are in soil, ranging from fine to coarse
- **Structure** - How soils hold together in clumps
- **Absorption** - How much moisture they can hold
- **Life** - What kinds of plants and animals live in soil

Gather samples of soils from three different locations. Observe and describe the differences between the samples by completing these **Soil Reports**.

Compare and rank the samples' color, texture, structure, absorption and abundance of life.

To observe texture and soil life, sprinkle some soil on a piece of white paper and observe with a magnifying glass. You can also use a microscope. To compare structure, pinch the samples between your finger and thumb.

To compare absorption, measure a tablespoon of soil from each sample onto a piece of paper. Using a dropper, add drops of water one at a time. Count how many drops the soil holds before it becomes **saturated**, and water runs out of the sample.

## SOIL REPORT - Sample 1

Place where sample was collected: \_\_\_\_\_

### Color

- Describe color: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 lightest color, 3 darkest: \_\_\_\_\_

### Texture

Rank sample from 1 to 3, with 1 finest, 3 coarsest: \_\_\_\_\_

### Structure

Rank sample from 1 to 3, with 1 loosest, 3 clumping together most: \_\_\_\_\_

### Absorption

- How many drops of water sample held: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 most absorbent, 3 least: \_\_\_\_\_

### Life Observed

- List organisms observed: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 having the most life, 3 the least: \_\_\_\_\_

## SOIL REPORT - Sample 2

Place where sample was collected: \_\_\_\_\_

### Color

- Describe color: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 lightest color, 3 darkest: \_\_\_\_\_

### Texture

Rank sample from 1 to 3, with 1 finest, 3 coarsest: \_\_\_\_\_

### Structure

Rank sample from 1 to 3, with 1 loosest, 3 clumping together most: \_\_\_\_\_

### Absorption

- How many drops of water sample held: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 most absorbent, 3 least: \_\_\_\_\_

### Life Observed

- List organisms observed: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 having the most life, 3 the least: \_\_\_\_\_

## SOIL REPORT - Sample 3

Place where sample was collected: \_\_\_\_\_

### Color

- Describe color: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 lightest color, 3 darkest: \_\_\_\_\_

### Texture

Rank sample from 1 to 3, with 1 finest, 3 coarsest: \_\_\_\_\_

### Structure

Rank sample from 1 to 3, with 1 loosest, 3 clumping together most: \_\_\_\_\_

### Absorption

- How many drops of water sample held: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 most absorbent, 3 least: \_\_\_\_\_

### Life Observed

- List organisms observed: \_\_\_\_\_
- Rank sample from 1 to 3, with 1 having the most life, 3 the least: \_\_\_\_\_

### Goal

Readers collect soil samples, then observe, describe and compare key characteristics while completing a Soil Report form.



# Strange Soil Facts

THOUGH IT IS ALL AROUND US, SO MUCH ABOUT SOIL REMAINS UNKNOWN.

THE MORE WE LEARN ABOUT SOIL, THE MORE AMAZING IT SEEMS!

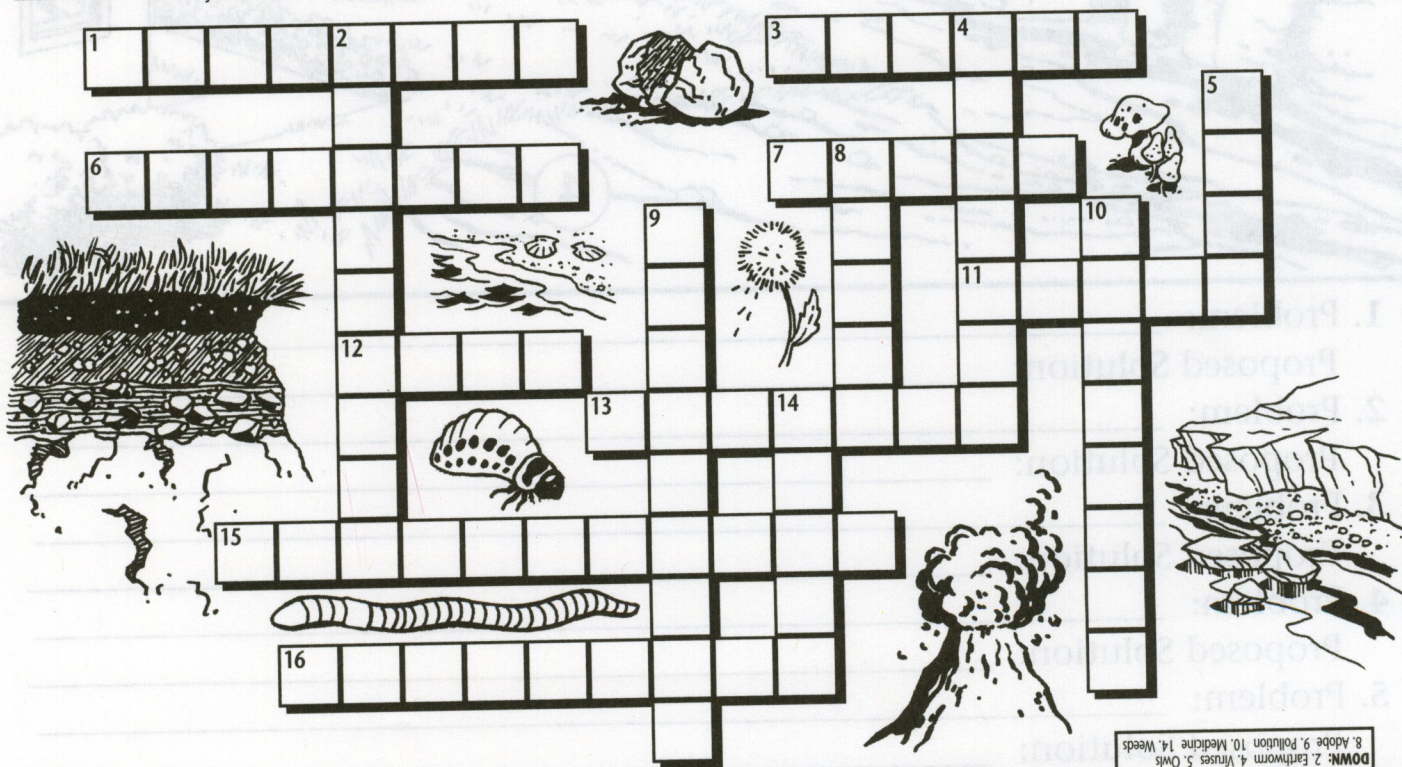
SOLVE THIS CROSSWORD PUZZLE WITH THESE CLUES THAT TELL YOU SOME STRANGE SOIL FACTS!

## Across

- Billions of these live in topsoil, and scientists have now found that even habitats three miles below earth's surface with very high temperatures can be home to \_\_\_\_\_.
- Ancient glaciers may have pushed and ground rock into smaller pieces, and when they melted, left large deposits of \_\_\_\_\_.
- Butterflies often flock to puddles on soil to drink dissolved \_\_\_\_\_.
- To absorb water and minerals from soil, a large tree may grow more than a hundred miles of root \_\_\_\_\_.
- Discovered by miners in 10,000 year-old silt, some of these sprouted and grew flowers, proving the amazing life force in \_\_\_\_\_.
- Some fungi in soil make traps that spring shut in one-tenth of a second to snare nematodes, an unsegmented type of \_\_\_\_\_.
- One unusual orchid in Australia lives entirely underground, peeking through small cracks in the soil only to attract flies to its \_\_\_\_\_.
- Scientists know that some trees need certain fungi in soil to grow, but we're just starting to learn how soil organisms live together in \_\_\_\_\_.
- Fertile soil near mountains can be formed by explosive ejection of mineral rich ash by \_\_\_\_\_.

## Down

- Charles Darwin wrote a book about this tunneling animal that enriches soil, stating that one of the most important animals in world history was the \_\_\_\_\_.
- Up to 20 times smaller than microscopic bacteria, some of the tiniest and most mysterious forms of soil life we know are \_\_\_\_\_.
- Their relatives live in trees and fly at night, but emerging by day from their homes in soil are Burrowing \_\_\_\_\_.
- People build homes from materials found in soil, like the Southwestern mix of straw and soil called \_\_\_\_\_.
- On land, soil is valuable, but when too much washes into waterways, it can be a major source of water \_\_\_\_\_.
- Studying soil fungi, plants and animals has helped us develop antibiotics and other kinds of \_\_\_\_\_.
- Scientists have found that soil may be enhanced and prepared for growing crop plants by plants that were thought to be \_\_\_\_\_.



## Goal

Readers solve a crossword puzzle using words derived from completing sentences that describe facts about soil and soil life.

ANSWERS - ACROSS: 1. Bacteria 3. Gravel 6. Minerals 7. Hairs 11. Seeds 12. Worm 13. Flowers 15. Communities 16. Volcanoes  
DOWN: 2. Earthworm 4. Viruses 5. Ovis 8. Adobe 9. Pollution 10. Medicine 14. Weeds

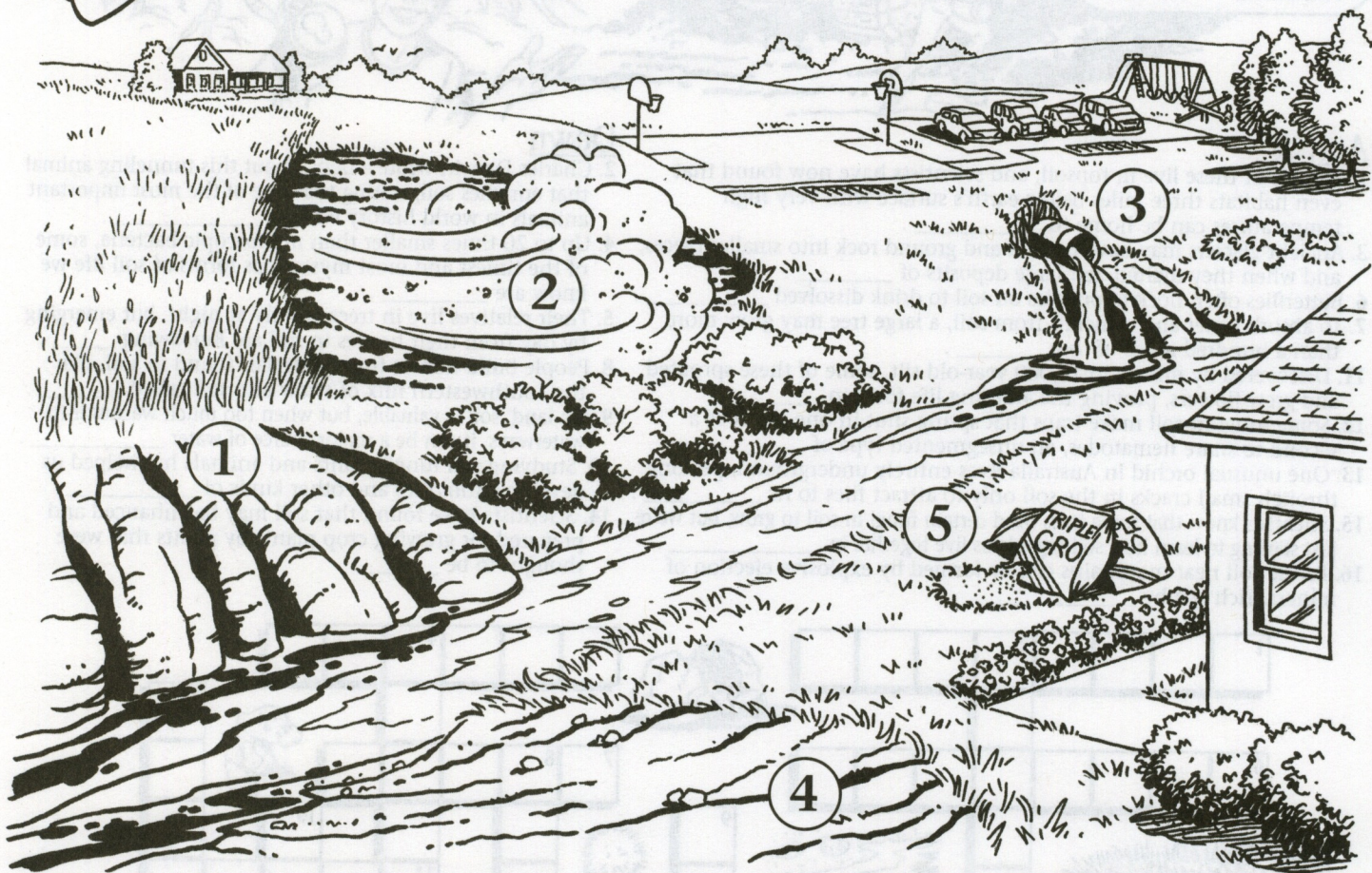


# SAVE...OUR...SOIL...



UH-OH! LOOKS LIKE SOME VALUABLE SOIL IS BEING **LOST** HERE. SOIL CAN BE LOST BY FORCES OF **NATURE** AND THE ACTIONS OF **PEOPLE**. FIND FIVE WAYS THAT SOIL IS BEING **ERODED** OR **DAMAGED** IN THIS PICTURE.

- Describe each problem below.
- Describe how you would **solve** each problem.
- Then **draw** your solution into the picture.



- Problem: \_\_\_\_\_  
Proposed Solution: \_\_\_\_\_
- Problem: \_\_\_\_\_  
Proposed Solution: \_\_\_\_\_
- Problem: \_\_\_\_\_  
Proposed Solution: \_\_\_\_\_
- Problem: \_\_\_\_\_  
Proposed Solution: \_\_\_\_\_
- Problem: \_\_\_\_\_  
Proposed Solution: \_\_\_\_\_

## Goal

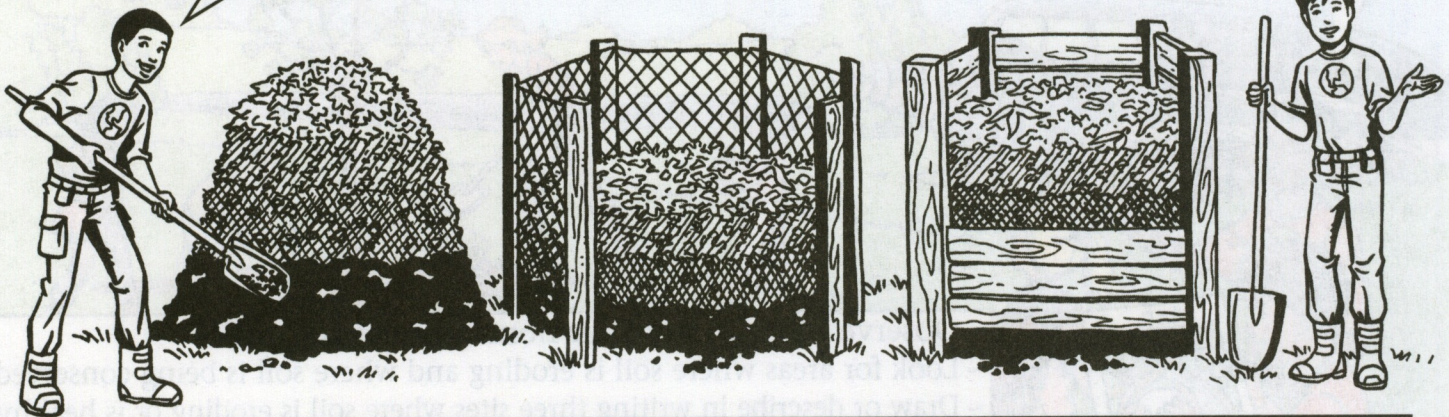
Readers identify and describe sources of soil erosion in a picture, propose solutions for reducing erosion, then draw the solutions into the picture.



# Your Own Soil Factory

IT'S FUN, EASY AND USEFUL TO MAKE YOUR OWN SOIL! CREATE A **SOIL FACTORY** IN YOUR OWN BACKYARD, OR ON THE GROUNDS OF YOUR SCHOOL. WATCH FOR YOURSELF HOW SOIL FORMS WHEN YOU MAKE A **COMPOST PILE**!

YOUR PILE CAN BE FANCY OR SIMPLE. FOLLOW THESE EASY STEPS TO BUILD IT.



- Choose a spot close enough to your home so you can reach it often, but not too close.
- Pile up organic matter, like leaves and grass clippings. Sprinkle some soil between layers to give your pile a supply of soil organisms.
- In dry weather, sprinkle with water occasionally to keep the pile moist.
- Add new organic matter, like vegetable peelings or apple cores. Don't add meat scraps - they'll attract pests.
- Once in a while, turn the pile with a shovel or pitchfork. This lets in air and helps break up the pile.
- Take composted soil from the bottom of the pile. Use this around shrubs and trees in your yard. Work it gently into the soil.



BILLIONS OF ORGANISMS WILL LIVE IN YOUR PILE AND TURN THE ORGANIC MATTER INTO NEW SOIL. WHEN YOU BUILD THE PILE, MAKE TWO PREDICTIONS:

## Predict...

- How many soil organisms you will observe:  
\_\_\_\_\_
- How many pounds of soil you can take from the pile after one month:  
\_\_\_\_\_

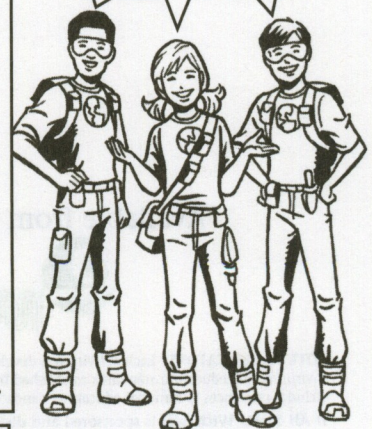
After three months:  
\_\_\_\_\_

## Then...

- After one month, dig gently through your pile and count how many different types of organisms you see:  
\_\_\_\_\_
- After one month dig out the new soil from the bottom of the pile. Use a bathroom scale to weigh the soil:  
\_\_\_\_\_
- After three months, dig out and weigh soil again: \_\_\_\_\_

Compare your results to your predictions.

WE THINK YOU'LL BE **AMAZED** BY YOUR **FANTASTIC SOIL FACTORY!**



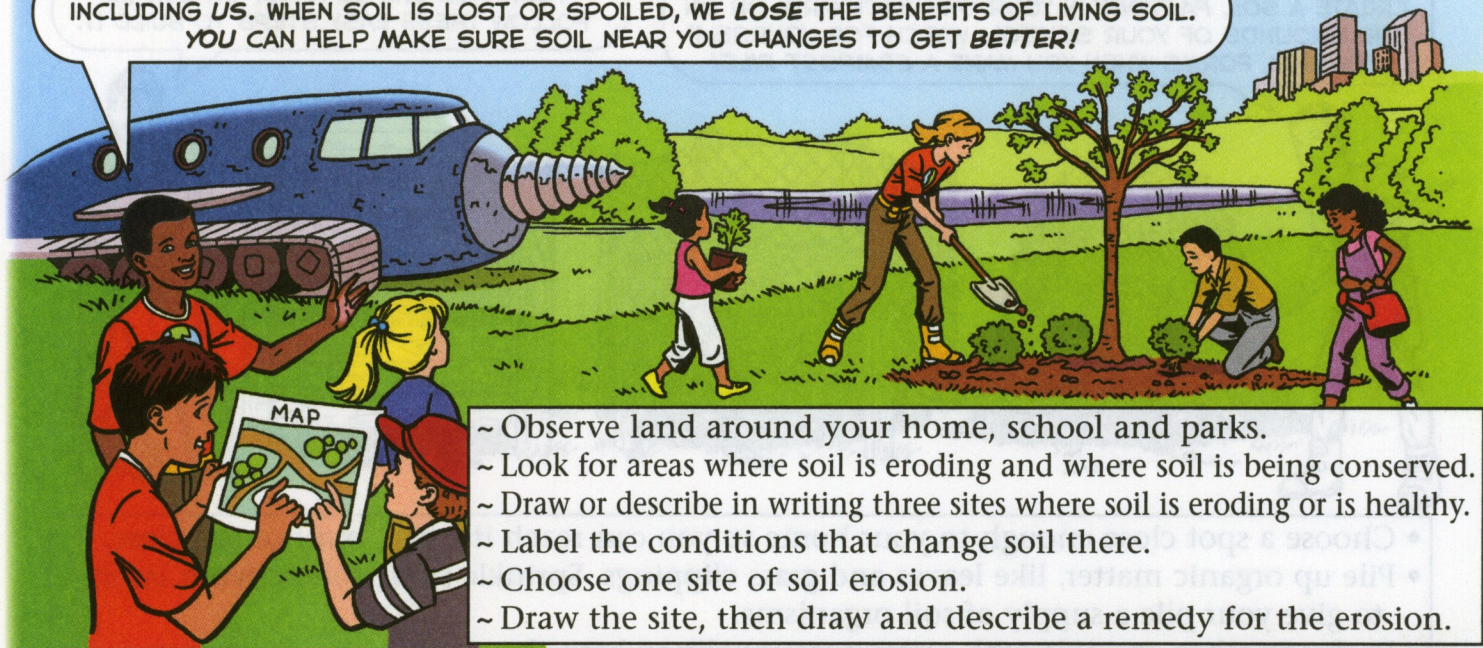
## Goal

Readers will be able to construct a compost pile, observe and record soil organisms there and measure the soil produced.



# SOIL SURVEY

SOIL IS ALWAYS CHANGING! AS HEALTHY SOIL FORMS IT HELPS COUNTLESS LIVING THINGS, INCLUDING US. WHEN SOIL IS LOST OR SPOILED, WE LOSE THE BENEFITS OF LIVING SOIL. YOU CAN HELP MAKE SURE SOIL NEAR YOU CHANGES TO GET BETTER!



- ~ Observe land around your home, school and parks.
- ~ Look for areas where soil is eroding and where soil is being conserved.
- ~ Draw or describe in writing three sites where soil is eroding or is healthy.
- ~ Label the conditions that change soil there.
- ~ Choose one site of soil erosion.
- ~ Draw the site, then draw and describe a remedy for the erosion.

ONE OF THE **BEST** WAYS TO HOLD AND IMPROVE SOIL IS TO KEEP IT COVERED WITH **PLANTS**. ASK AN ADULT TO HELP YOU PLANT A TREE, SOME BUSHES OR SOME GROUND COVER. YOU'LL FEEL GREAT, KNOWING YOU ARE HELPING KEEP YOUR WORLD FULL OF LIFE.



THINK ABOUT THE AMAZING VARIETY OF LIFE ON LAND AND REMEMBER... **IT ALL STARTS WITH SOIL!**

Available from your local conservation district, state natural resources agency and the



**National Association of Conservation Districts**

408 East Main P.O. Box 855 League City, TX 77574-0855

1-800-825-5547, ext. 32 [www.nacdnet.org](http://www.nacdnet.org)

**NOTE TO EDUCATORS:** Each activity was developed with an educational goal in mind that should be adapted to the needs of the grade level you are teaching. Also, each activity is correlated to environmental education standards established by the North American Association of Environmental Education, as outlined in the book Excellence in EE – Guidelines for Learning (K-12). Each guideline includes references to national education standards that form the basis for the state standards you follow.

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